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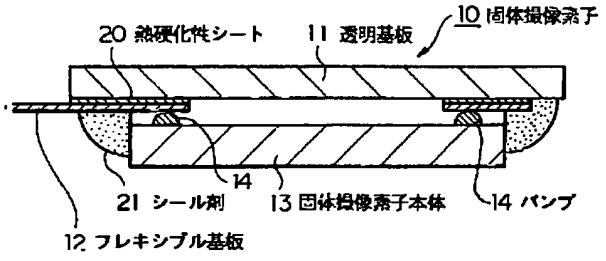
(54)【発明の名称】　固体撮像素子および固体撮像素子の製造方法

(57)【要約】
【課題】　撮像装置に組み込む際の組立て性や、コストの面についても改善したチップサイズパッケージ構造の固体撮像素子の提供が望まれている。
【解決手段】　透明基板１１の一方の面に、配線パターン１８を形成しかつ開口部１９を有したフレキシブル基板１２の一方の面が接着され、このフレキシブル基板１２の他方の面に、固体撮像素子本体１３がその撮像面を開口部１９内に臨ませた状態でバンプ１４を介して電気的に接続され、フレキシブル基板１２の他方の面と固体撮像素子本体１３の少なくとも側面がシール剤２１で接着されて透明基板１１と固体撮像素子本体１３との間が気密封止されている固体撮像素子１０。



【特許請求の範囲】
【請求項1】 透明基板の一方の面に、配線パターンを形成しかつ開口部を有したフレキシブル基板の一方の面が接着され、
このフレキシブル基板の他方の面に、固体撮像素子本体がその撮像面を前記開口部内に臨ませた状態でバンプを介して電気的に接続され、
前記フレキシブル基板の他方の面と固体撮像素子本体の少なくとも側面がシール剤で接着されて前記透明基板と固体撮像素子本体との間が気密封止されてなることを特徴とする固体撮像素子。
【請求項2】 前記フレキシブル基板の他方の面には、前記バンプとの接続位置と開口部の開口縁との間に、前記開口縁に沿った環状の隆起部が前記バンプの高さより低い高さで形成されていることを特徴とする請求項1記載の固体撮像素子。
【請求項3】 透明基板の一方の面に、配線パターンを形成しかつ開口部を有したフレキシブル基板の一方の面を熱硬化性シートで接着する工程と、
このフレキシブル基板の他方の面に、固体撮像素子本体をその撮像面が前記開口部内に臨む状態でバンプを介して電気的に接続する工程と、
前記フレキシブル基板の他方の面と固体撮像素子本体の少なくとも側面をシール剤で接着して前記透明基板と固体撮像素子本体との間を気密封止する工程とを備えたチップサイズパッケージ構造の固体撮像素子の製造方法であって、
透明基板の一方の面にフレキシブル基板の一方の面を熱硬化性シートで接着する工程を、外形決めを行う前の熱硬化性シートにフレキシブル基板の開口部より大きい開口部を有した開口部を形成しておき、続いて予め開口部を形成するとともに配線パターンを形成した外形決めを行う前のフレキシブル基板を、該フレキシブル基板の開口部の開口縁が前記熱硬化性シートの開口部の開口縁より内側に位置するようにして該熱硬化性シートに重ね合わせ、次いでこれらを共に切断することでそれぞれの外形を合わした状態でその外形決めを行い、その後重ね合わせた状態で外形が決められた熱硬化性シートとフレキシブル基板とをその熱硬化性シートが透明基板の一方の面に当接するようにして位置合わせし、加熱することによって該熱硬化性シートを硬化させることにより透明基板の一方の面にフレキシブル基板の一方の面を接着することで行うことを特徴とする固体撮像素子の製造方法。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】本発明は、チップサイズパッケージ構造の固体撮像素子とその製造方法に関する。
【0002】
【従来の技術】固体撮像素子を備えた固体撮像装置は、その小型化が進むに伴い、デジタルカメラなどの携帯用撮像装置として盛んに用いられるようになってきている。固体撮像素子は、オンチップマイクロレンズ等を備えて集光する機能と、光電変換回路を備えて光電変換をなす機能とを有し、被写体からの光を受光してこれを電気信号に変換し、出力する半導体素子である。なお、本明細書では、便宜的に、固体撮像素子とこれを保持する透明基板等を含めて「固体撮像素子」と呼称し、固体撮像素子自体については「固体撮像素子本体」と呼称する。
【0003】従来、固体撮像素子としては、図8に示すように樹脂やセラミックスからなる中空のパッケージ1に固体撮像素子本体2を搭載し、この固体撮像素子本体2とインナーリード3とをワイヤボンディングして該インナーリード3を介して固体撮像素子本体2を外部リード5と電気的に接続し、ガラスや樹脂からなる透明基板（リッド）4で固体撮像素子本体2を搭載した中空部を封止した構造のものが知られている。
【0004】
【発明が解決しようとする課題】しかしながら、このように中空のパッケージ1を用いた構造のものでは、例えば固体撮像素子本体2が4～5mm□の場合にパッケージ1の外形サイズが10～12mmとなってしまい、またその厚さについても固体撮像素子本体2が0．6mmの場合にパッケージ1の厚さが3．0～3．5mmとなってしまうなど、今後益々要求される小型化には対応しきれず、したがってパッケージ1を用いない構造の固体撮像素子が求められていた。
【0005】このようなパッケージ1を用いない構造の固体撮像素子としては、特開平5-6989号公報に記載された構造の撮像装置が知られている。この撮像装置は、少なくとも央部に透光部を有する板状体と、前記板状体の一つの面に形成された複数の導体パターンと、前記導体パターンのそれぞれの内端に電極が接続され、前記板状体に受光面を向けて固定された撮像素子と、前記板状体と前記撮像素子受光面との間の空間を密閉する封止手段とを有するものである。しかしながらこの撮像装置にあっても、デジタルカメラなどの携帯用撮像装置に組み込む際の組立て性や、コストの面で不満があり、さらなる改善が求められている。
【0006】本発明は前記事情に鑑みてなされたもので、その目的とするところは、撮像装置に組み込む際の組立て性や、コストの面についても改善したチップサイズパッケージ構造の固体撮像素子とその製造方法を提供することにある。
【0007】
【課題を解決するための手段】本発明の固体撮像素子は、透明基板の一方の面に、配線パターンを形成しかつ開口部を有したフレキシブル基板の一方の面が接着され、このフレキシブル基板の他方の面に、固体撮像素子本体がその撮像面を前記開口部内に臨ませた状態でバン

プを介して電気的に接続され、前記フレキシブル基板の他方の面と固体撮像素子本体の少なくとも側面がシール剤で接着されて前記透明基板と固体撮像素子本体との間が気密封止されてなることを前記課題の解決手段とした。

【０００８】この固体撮像素子によれば、透明基板の一方の面にフレキシブル基板を介して固体撮像素子本体が設けられているので、全体がチップサイズパッケージ構造のものとなって小型化されたものとなる。また、配線パターンを形成したフレキシブル基板に固体撮像素子本体を電気的に接続しているので、このフレキシブル基板の配線パターンによって例えばデジタルカメラなどの撮像装置に組み込む際の組立て性が良好となり、またフレキシブル基板そのものの作製は透明基板に直接配線パターンを形成するのに比べ安価となるので、全体のコストの面についても有利となる。

【０００９】また、前記フレキシブル基板の他方の面の、前記バンプとの接続位置と開口部の開口縁との間に、前記開口縁に沿った環状の隆起部を前記バンプの高さより低い高さで形成すれば、この隆起部がシール剤をせき止めるよう機能することから、シール剤が硬化するまでの間にこれが固体撮像素子本体と透明基板との間の空間に染み出ることが抑えられる。

【００１０】また、本発明の固体撮像素子の製造方法では、透明基板の一方の面に、配線パターンを形成しかつ開口部を有したフレキシブル基板の一方の面を熱硬化性シートで接着する工程と、このフレキシブル基板の他方の面に、固体撮像素子本体をその撮像面が前記開口部内に臨む状態でバンプを介して電気的に接続する工程と、前記フレキシブル基板の他方の面と固体撮像素子本体の少なくとも側面をシール剤で接着して前記透明基板と固体撮像素子本体との間を気密封止する工程とを備えたチップサイズパッケージ構造の固体撮像素子の製造方法において、透明基板の一方の面にフレキシブル基板の一方の面を熱硬化性シートで接着する工程を、外形決めを行う前の熱硬化性シートにフレキシブル基板の開口部より大きい開口部を有した開口部を形成しておき、続いて予め開口部を形成するとともに配線パターンを形成した外形決めを行う前のフレキシブル基板を、該フレキシブル基板の開口部の開口縁が前記熱硬化性シートの開口部の開口縁より内側に位置するようにして該熱硬化性シートに重ね合わせ、次いでこれらを共に切断することでそれぞれの外形を合わした状態でその外形決めを行い、その後重ね合わせた状態で外形が決められた熱硬化性シートとフレキシブル基板とをその熱硬化性シートが透明基板の一方の面に当接するようにして位置合わせし、加熱することによって該熱硬化性シートを硬化させることにより透明基板の一方の面にフレキシブル基板の一方の面を接着することで行うことを前記課題の解決手段とした。

【００１１】この製造方法によれば、透明基板の一方の面にフレキシブル基板の一方の面を熱硬化性シートで接着する工程を、フレキシブル基板の開口部の開口縁が熱硬化性シートの開口部の開口縁より内側に位置するようにして該フレキシブル基板を熱硬化性シートに重ね合わせ、次いで、打ち抜き等による切断によってこれらの外形決めを共に行い、その後、加熱することによって熱硬化性シートを硬化させることにより透明基板の一方の面にフレキシブル基板の一方の面を接着することで行うので、熱硬化性シートを加熱して硬化させた際、溶融した熱硬化性シートがフレキシブル基板の開口部側に染み出ても、フレキシブル基板の開口部の開口縁を熱硬化性シートの開口部の開口縁より内側に位置させているので、染み出た熱硬化性シートの溶融物がフレキシブル基板の開口部内にまではみ出ることを抑えることが可能になる。

【００１２】

【発明の実施の形態】以下、本発明を詳しく説明する。図１、図２、図３は本発明の固体撮像素子の第１の実施形態例を示す図であり、これらの図において符号１０はチップサイズパッケージのＣＣＤ型の固体撮像素子である。この固体撮像素子１０は、図１に示すようにカバーとなるガラスまたは樹脂からなる透明基板（リッド）１１の一方の面にフレキシブル基板（フレキテープ）１２の一方の面が接着され、このフレキシブル基板１２の他方の面にＣＣＤ固体撮像素子本体１３がＡｕスタッドバンプ等からなるバンプ１４を介して電気的に接続され、フレキシブル基板１２の他方の面と固体撮像素子本体１３の側面とがシール剤で接着されて前記透明基板１１と固体撮像素子本体１３との間が気密封止されて構成されたものである。

【００１３】フレキシブル基板１２は、固体撮像素子１０の裏側を示す図２、およびその表側を示す図３に示すように、透明基板１１と固体撮像素子本体１３との間に配置される環状板部１５と、比較的細い連結部１６と、この連結部１６を介して環状板部１５に連続する四辺形板部１７とからなるもので、その裏面側に銅製の配線パターン１８が露出するようにしてこれの両面をポリイミドで覆って形成されたものである。

【００１４】環状板部１５には略矩形状の開口部１９が形成されており、この開口部１９内には前記固体撮像素子本体１３の撮像面１３ａが臨んで配置されている。配線パターン１８は、バンプ１４を介して固体撮像素子本体１３と電気的に接続されており、四辺形板部１７に形成された外部リード１８ａによって電気信号の入出力をなすようになっている。

【００１５】フレキシブル基板１２は、熱硬化性シート、液状熱硬化樹脂、ＵＶ硬化型樹脂等の接着剤によって透明基板１１の一方の面に接着されたもので、本例では接着剤として熱硬化性シート２０が用いられている。この熱硬化性シート２０は、熱硬化性樹脂であるエポキ

シ樹脂が予め半硬化させられて形成されたもので、後述するように加熱されることによって一旦溶融した後硬化するものである。

【００１６】このような構成の固体撮像素子１０を製造するには、まず、固体撮像素子本体１３のＡｌ電極（図示略）上にバンプ１４を形成する。本例においてはスタッドバンプボンダーにより、Ａｕバンプをａｌ電極（図示略）上に接合してバンプ１４を形成する。接合条件としては、３０～１００ｇの加圧下にて１５０～１８０℃の温度で１０～３０ｍｓｅｃ加熱するといった条件が採用される。なお、Ａｕスタッドバンプに代えてはんだ等を用いることもできる。

【００１７】また、これとは別に、フレキシブル基板１２の一方の面に予め熱硬化性シート２０を仮接着したものを用意し、これの熱硬化性シート２０側を透明基板１１に接合させ、ヒートコラムまたはオーブンでキュアすることによって熱硬化性シート２０を一旦溶融させた後硬化せしめる。この硬化については、ヒートコラムの場合、２００ｇ～３ｋｇ／ｃｍ^2 の加圧下において、１５０～２００℃の温度で2～２０分間キュアするといった条件が採用される。また、オーブンの場合には、同じく２００ｇ～３ｋｇ／ｃｍ^2 の加圧下において、１５０～２００℃の温度で１０分～２時間キュアするといった条件が採用される。

【００１８】次に、固体撮像素子本体１３のバンプ１４上にＡｇペーストを塗布し、続いてこのバンプ１４とフレキシブル基板１２の他方面における配線パターン（図示略）とを位置合わせしてこれらの間を加圧する。このとき、固体撮像素子本体１３の撮像面１３ａがフレキシブル基板１２の開口部１９内に臨むように位置合わせする。そして、この加圧した状態で１５０℃にて１分以上加熱し、Ａｇペーストキュアを行う。なお、バンプ１４とフレキシブル基板１２の配線とが圧接のみで接続性に問題なければ、Ａｇペーストを用いなくてもよい。

【００１９】次いで、フレキシブル基板１２の他方の面と固体撮像素子本体１３の側面との間にディスペンス等でシール剤２１を適量塗布し、このシール剤２１で接着して前記透明基板１１と固体撮像素子本体１３との間を気密封止する。シール剤２１としては、ＵＶ・熱併用シール剤や熱硬化化シール剤が使用可能であるが、作業性が良いなどの点でＵＶ熱併用型樹脂を用いるのが望ましい。このようなＵＶ熱併用型樹脂を用いた場合、紫外線を１０００～３０００ｍＪで照射してこれを硬化せしめる。

【００２０】なお、シール剤２１については、１種だけでなく2種あるいはそれ以上を用いて多重のシール構造としてもよく、その場合に例えば内部に耐湿性の高いシール剤を用い、外部に樹脂クラック、リッドクラックを防止する低硬度シール剤を用いる構造などを採用することができる。そして、このように多重シール構造とすれば、耐湿性の向上や機械強度の向上を図ることができる。

【００２１】このようにして紫外線照射を行ったら、紫外線照射されていない部分を含めた全体を十分に硬化させるため、ポストキュアを行う。このポストキュアの条件としては、ヒートブロック加熱の場合１４０～１６０℃で１分～６０分加熱を行う。なお、ヒートブロック加熱に代えてオーブンキュアを採用するようにしてもよい。

【００２２】このようにして得られた固体撮像素子１０では、フレキシブル基板１２を除いた場合の最大外形となる透明基板１１の外形サイズが、固体撮像素子本体１３の外形サイズが3～６ｍｍ□であるとき４～８ｍｍ□となり、厚さも１．０～１．３ｍｍとなる。したがって、従来のごとく中空のパッケージを用いた構造のものに比べ、本発明の固体撮像素子１０は例えばパッケージ面積を約５８％に縮小し、パッケージ厚さを約６１％に縮小し、パッケージ体積を約８３％に縮小することができるなど、その外形サイズを大幅に小型化することができる。

【００２３】また、例えばシール剤２１を多重シール構造とすることにより、耐湿性等の向上を可能にして高信頼性を実現することができる。具体的には、高温高湿バイアスについては８５°℃、８５％で５０４時間、ヒートサイクルについては－５５℃～１２５℃で１００サイクルをそれぞれクリアーすることができる。

【００２４】ここで、前記のフレキシブル基板１２の一方の面に予め熱硬化性シート２０を仮接着する工程を基に、本発明の固体撮像素子の製造方法の一例を説明する。まず、図４（ａ）に示すように厚さ２０～５０μｍ程度の大判状の熱硬化性シート２２を用意し、この大判状熱硬化性シート２２に、フレキシブル基板１２の開口部１９より縦横共に０．４～１．０ｍｍ程度大きい略矩形状の開口部２３を、打ち抜きによって形成する。

【００２５】続いて、図４（ｂ）に示すように予め開口部１９を形成するとともに配線パターン１８（図示略）を形成した外形決めを行う前の多連のフレキシブル基板２４を、図４（ｃ）に示すようにその開口部１９の開口縁が前記大判状熱硬化性シート２２の開口部２３の開口縁より０．２～０．５ｍｍ程度内側に位置するようにして、該大判状熱硬化性シート２３の上に重ね合わせる。

【００２６】次いで、これら多連のフレキシブル基板２４と大判状熱硬化性シート２３とを図４（ｃ）中二点鎖線で示した位置にて共に打ち抜き切断し、それぞれの外形を合わした状態でその外形決めを行い、結果として外形抜きがなされた単個のフレキシブル基板１２の一方の面に、図５（ａ）に示すように単個の熱硬化性シート２０を仮接着する。

【００２７】なお、このようにしてフレキシブル基板１２の一方の面に熱硬化性シート２０を仮接着したら、前

述したようにこれの熱硬化性シート２０が透明基板１１の一方の面に当接するようにして位置合わせし、加圧加熱することによって該熱硬化性シート２０を溶融硬化させ、透明基板１１の一方の面にフレキシブル基板１２の一方の面を接着する。

【００２８】このようにしてフレキシブル基板１２の一方の面に熱硬化性シート２０を仮接着したものを用い、熱硬化性シート２０を溶融硬化させて透明基板１１の一方の面にフレキシブル基板１２の一方の面を接着すると、熱硬化性シート２０を加熱して硬化させた際、接着面の密着性を高めるため加圧することにより溶融した熱硬化性シート２０がフレキシブル基板１２の開口部１９側に染み出ても、フレキシブル基板１２の開口部１９の開口縁を熱硬化性シート２０の開口部２３の開口縁より内側に位置させているので、図５（ｂ）に示すように染み出た熱硬化性シート２０の溶融物がフレキシブル基板１２の開口部１９内にまではみ出ることを抑えることができる。

【００２９】すなわち、図５（ｃ）に示すように熱硬化性シート２０の開口部２３の開口縁をフレキシブル基板１２の開口部１９の開口縁に一致させた場合に、熱硬化性シート２０を加圧加熱して硬化させた際、図５（ｄ）に示すように熱硬化性シート２０の溶融物がフレキシブル基板１２の開口部１９内にまではみ出てしまい、固体撮像素子本体１３の撮像特性を損なってしまうものの、本例では前述したようにフレキシブル基板１２の開口部１９の開口縁を熱硬化性シート２０の開口部２３の開口縁より内側に位置させているので、熱硬化性シート２０の溶融物がフレキシブル基板１２の開口部１９内にまではみ出ることを防止することができるのである。

【００３０】図６、図７は本発明の固体撮像素子の第２の実施形態例を示す図であり、これらの図において符号３０はチップサイズパッケージのＣＣＤ型の固体撮像素子、３２はフレキシブル基板である。この固体撮像素子３０が図１、図２、図３に示した固体撮像素子１０と異なるところは、前記フレキシブル基板３２の他方の面（バンプ１４を介して固体撮像素子本体１３と接合する側の面）における、バンプ１４との接続位置と開口部１９の開口縁との間に、前記開口縁に沿った環状の隆起部３１が形成されている点である。

【００３１】この隆起部３１は、フォトレジスト膜によって形成されたもので、前記バンプ１４の高さより僅かに低い高さ、例えば５μｍ以上、３０μｍ以下の範囲に形成されたものであり、本例では１０μｍの高さに形成されたものである。なお、この隆起部３１の高さとしては、バンプ１４の高さに限りなく近い高さとするのが好ましい。このように隆起部３１の高さをバンプ１４の高さより低く形成しているので、隆起部３１は固体撮像素子本体１３に対して僅かに隙間を有するように配設され、よってバンプ１４とフレキシブル基板３２上の配線３２ａとの接合に干渉しないようになっている。また、隆起部３１の幅については、後述するように接着剤の染み込みを防ぐことができればよく、例えば１０μｍ以上２００μｍ以下程度とされる。

【００３２】このような構成の固体撮像素子３０にあっては、フレキシブル基板３２の他方の面における、バンプ１４との接続位置と開口部１９の開口縁との間に、前記開口縁に沿った環状の隆起部３１を形成しているので、この隆起部３１がシール剤２１をせき止めるよう機能することから、製造時、シール剤２１を塗布してこれを硬化させる際、図７中二点鎖線で示すように該シール剤２１が硬化するまでの間にこれが固体撮像素子本体１３と透明基板１１との間の空間に染み出し、固体撮像素子本体１３の撮像面１３ａにかかってしまうことを防ぐことができ、これにより撮像面全面に亘って良好な撮像品質を確保することができる。また、このようなシール剤２１の染み出しによる不良発生が防止されることから、その製品歩留りが向上してコストダウンが図られたものとなる。

【００３３】

【発明の効果】以上説明したように本発明の固体撮像素子は、透明基板の一方の面にフレキシブル基板を介して固体撮像素子本体が設けられたものであるから、全体がチップサイズパッケージ構造のものとなって小型化されたものとなり、これにより例えばデジタルカメラなどの携帯用撮像装置に好適に使用され得るものとなる。また、配線パターンを形成したフレキシブル基板に固体撮像素子本体を電気的に接続しているので、このフレキシブル基板の配線パターンによってデジタルカメラなどの撮像装置に組み込む際の組立て性が良好となり、またフレキシブル基板そのものの作製は透明基板に直接配線パターンを形成するのに比べ安価となるので、全体のコストの面についても有利となる。

【００３４】また、フレキシブル基板の他方の面の、前記バンプとの接続位置と開口部の開口縁との間に、前記開口縁に沿った環状の隆起部を前記バンプの高さより低い高さで形成すれば、この隆起部がシール剤をせき止めるよう機能することから、シール剤が硬化するまでの間にこれが固体撮像素子本体と透明基板との間の空間に染み出し、固体撮像素子本体の撮像面にかかってしまうことを防ぐことができ、これにより撮像面全面に亘って良好な撮像品質を確保することができる。また、このようなシール剤の染み出しによる不良発生を防止することができることから、製品歩留りを向上してコストダウンを図ることができる。

【００３５】本発明の固体撮像素子の製造方法は、フレキシブル基板の開口部の開口縁を熱硬化性シートの開口部の開口縁より内側に位置させたことにより、熱硬化性シートを加熱して硬化させた際、溶融した熱硬化性シートがフレキシブル基板の開口部側に染み出ても、染み出

た熱硬化性シートの溶融物がフレキシブル基板の開口部内にまではみ出ることを抑えるようにしたものであるから、固体撮像素子本体の撮像面上に熱硬化性シートを形成する樹脂がかかるのを防止して撮像性能の信頼性を確保することができ、また樹脂のはみ出しによる不良を防止して組立製造プロセスの安定化を図り、歩留りを向上することができる。

【図面の簡単な説明】

【図１】本発明における固体撮像素子の第１の実施形態例の、概略構成を示す側断面図である。

【図２】図１に示した固体撮像素子の裏面側を示す図である。

【図３】図１に示した固体撮像素子の表面側を示す図である。

【図４】（ａ）～（ｃ）は、本発明の固体撮像素子の製造方法の一例を工程順に説明するための図である。

【図５】（ａ）～（ｄ）は、本発明の固体撮像素子の製造方法の効果を説明するための図である。

【図６】本発明における固体撮像素子の第２の実施形態例の、表面側を示す概略構成図である。

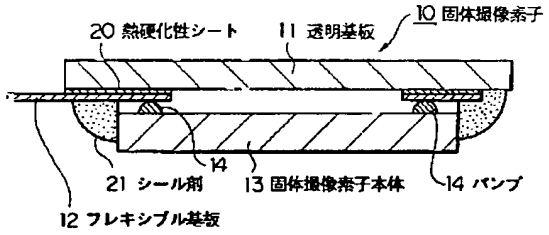
【図７】図６に示した固体撮像素子の要部側断面図である。

【図８】従来の固体撮像素子の概略構成を示す側断面図である。

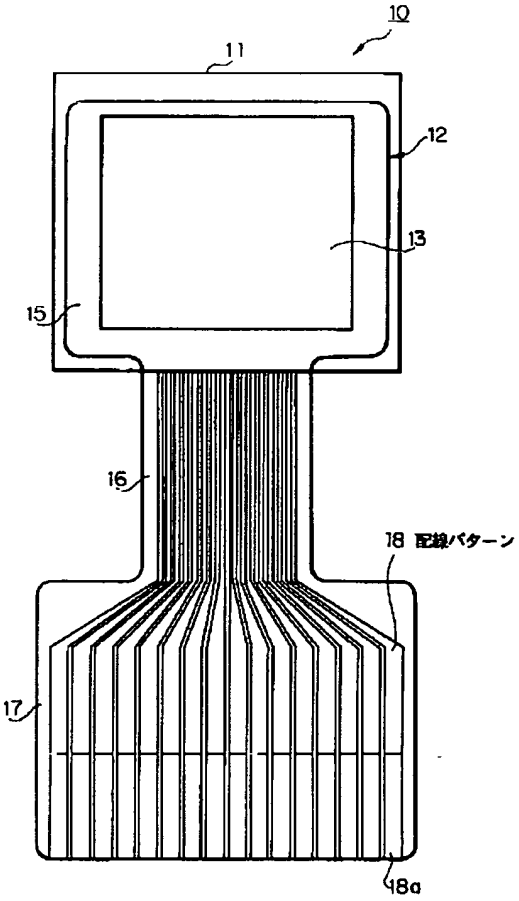
【符号の説明】

１０…固体撮像素子、１１…透明基板、１２…フレキシブル基板、１３…固体撮像素子本体、１４バンプ、１８…配線パターン、１９…開口部、２０…熱硬化性シート、２１…シール剤、２２…大判状の熱硬化性シート、２３…開口部、２４…多連のフレキシブル基板、３０…固体撮像素子、３１…隆起部、３２…フレキシブル基板

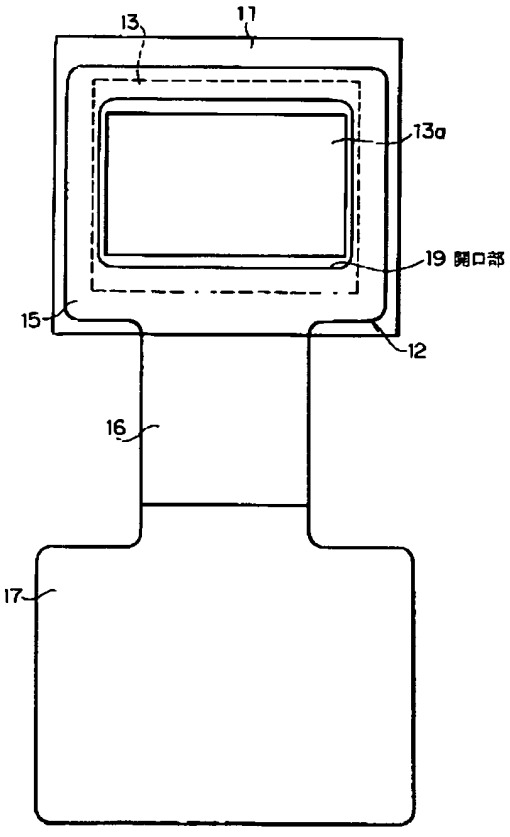
【図１】



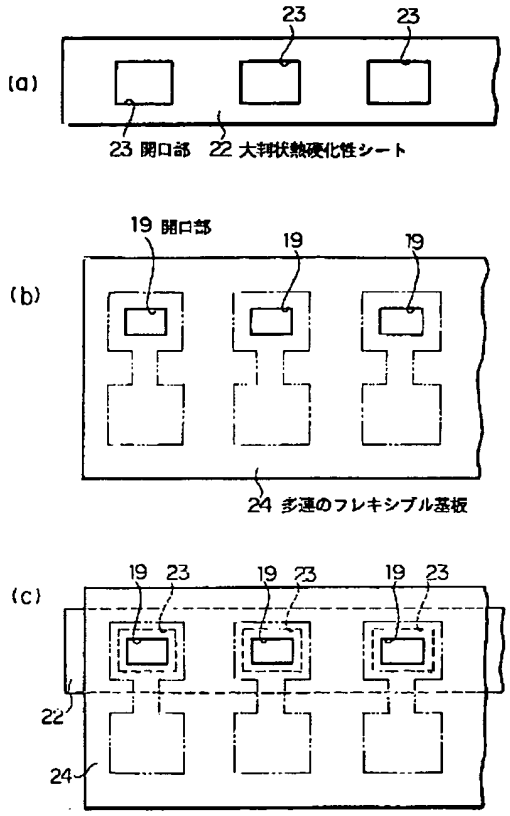
【図２】



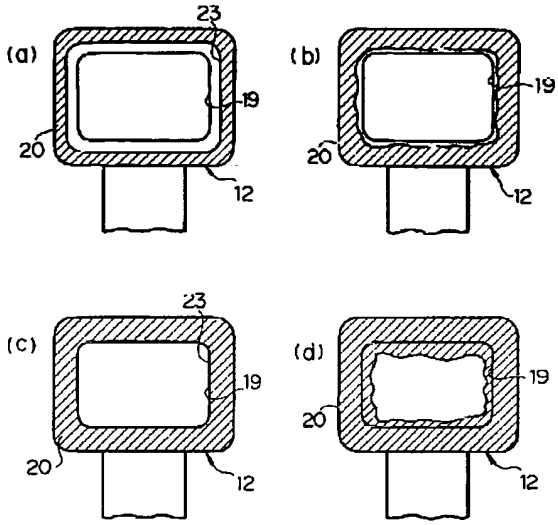
【図３】



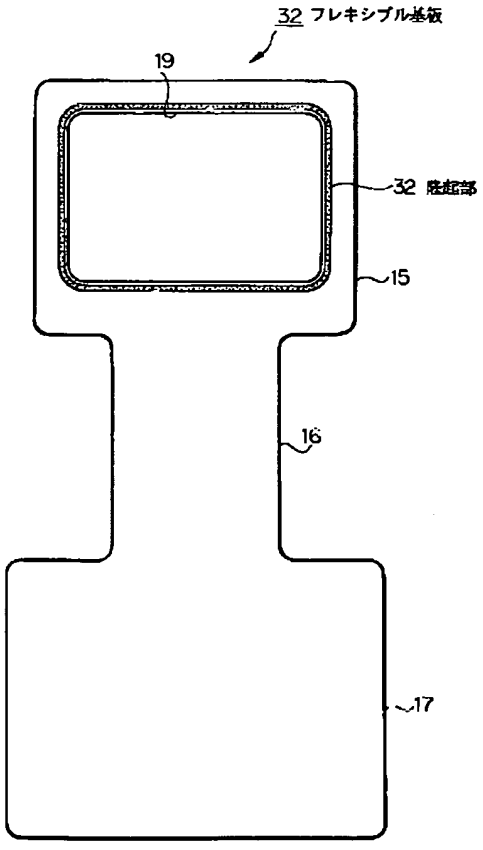
【図4】


(a)
23
23
23 開口部
22 大判状熱硬化性シート
(b)
19 開口部
19
19
24 多連のフレキシブル基板
(c)
19
23
19
23
19
23
22
24

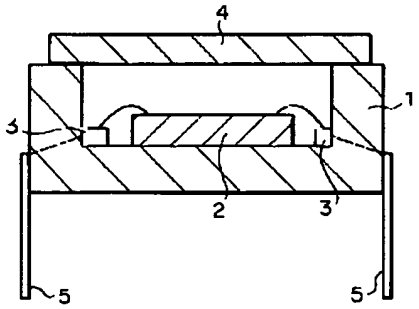
【図5】


(a)
23
19
20
12
(b)
19
20
12
(c)
23
19
20
12
(d)
19
20
12

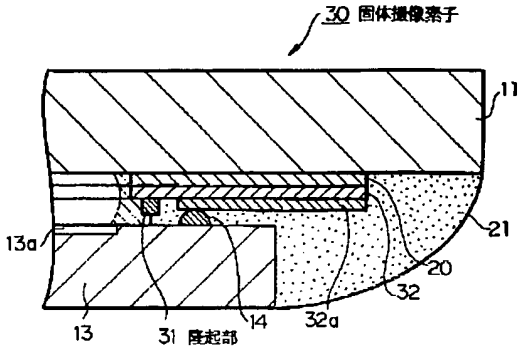
【図6】


32 フレキシブル基板
19
32 陰極部
15
16
17

【図8】


4
1
3
2
3
5
5

【図7】



フロントページの続き

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HA12 HA24 HA27 HA31
5C024 AA01 CA31 FA01 FA16 FA17
FA18 FA19

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional side elevation showing the outline configuration of the 1st example of an operation gestalt of the solid state image sensor in this invention.
[Drawing 2] It is drawing showing the rear-face side of the solid state image sensor shown in drawing 1 .
[Drawing 3] It is drawing showing the front-face side of the solid state image sensor shown in drawing 1 .
[Drawing 4] (a) - (c) is drawing for explaining an example of the manufacture approach of the solid state image sensor of this invention in order of a process.
[Drawing 5] (a) - (d) is drawing for explaining the effectiveness of the manufacture approach of the solid state image sensor of this invention.
[Drawing 6] It is the outline block diagram showing the front-face side of the 2nd example of an operation gestalt of the solid state image sensor in this invention.
[Drawing 7] It is the important section sectional side elevation of the solid state image sensor shown in drawing 6 .
[Drawing 8] It is the sectional side elevation showing the outline configuration of the conventional solid state image sensor.
[Description of Notations]
10 [-- The body of a solid state image sensor, 14 bumps, 18 / -- A circuit pattern, 19 / -- Opening, 20 / -- A thermosetting sheet, 21 / -- A sealing compound, 22 / -- A thermosetting large-sized sheet, 23 / -- Opening, 24 / -- The flexible substrate of a multiple string, 30 / -- A solid state image sensor, 31 / -- A ridge, 32 / -- Flexible substrate] -- A solid state image sensor, 11 -- A transparence substrate, 12 -- A flexible substrate, 13

[Translation done.]

* NOTICES *

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MEANS

[Means for Solving the Problem] The solid state image sensor of this invention forms a circuit pattern in one field of a transparence substrate, and one field of a flexible substrate with opening pastes it up. The body of a solid state image sensor is electrically connected to the field of another side of this flexible substrate through a bump in the condition of having made that image pick-up side overlooking in said opening. The field of another side of said flexible substrate and the thing of the body of a solid state image sensor which a side face pastes up by the sealing compound at least, and it comes to do the hermetic seal of between said transparence substrates and bodies of a solid state image sensor were made into the solution means of said technical problem.
[0008] According to this solid state image sensor, since the body of a solid state image sensor was prepared in one field of a transparence substrate through the flexible substrate, the whole became the thing of chip-size package structure, and was miniaturized. Moreover, since the assembly nature at the time of including in image pick-up equipments, such as a digital camera, with the circuit pattern of this flexible substrate since the body of a solid state image sensor is electrically connected to the flexible substrate in which the circuit pattern was formed becomes good and production of the flexible substrate itself becomes cheap compared with forming a direct circuit pattern in a transparence substrate, it becomes advantageous also about the field of the whole cost.
[0009] Moreover, if the annular ridge along said opening edge is formed in height lower than said bump's height between a connecting location with said bump of the field of another side of said flexible substrate, and the opening edge of opening, since it will function as this ridge damming up a sealing compound, it is suppressed that this will ooze to the space between the body of a solid state image sensor and a transparence substrate by the time a sealing compound hardens.
[0010] moreover, by the manufacture approach of the solid state image sensor of this invention The process which forms a circuit pattern in one field of a transparence substrate, and pastes up one field of a flexible substrate with opening with a thermosetting sheet, The process electrically connected to the field of another side of this flexible substrate through a bump in the condition that that image pick-up side faces the body of a solid state image sensor in said opening, In the manufacture approach of the solid state image sensor of the chip-size package structure equipped with the field of another side of said flexible substrate, and the process of the body of a solid state image sensor which pastes up a side face by the sealing compound at least, and carries out the hermetic seal of between said transparence substrates and bodies of a solid state image sensor The process which pastes up one field of a flexible substrate on one field of a transparence substrate with a thermosetting sheet Opening with larger opening than opening of a flexible substrate is formed in the thermosetting sheet before performing an appearance arrangement. Then, the flexible substrate before performing the appearance arrangement which formed the circuit pattern while forming opening beforehand It is made for the opening edge of opening of this flexible substrate to be located inside the opening edge of opening of said thermosetting sheet. On this thermosetting sheet Superposition, Subsequently, where each appearance is together put by cutting these [both], the appearance arrangement is performed. In the condition of having piled up after that, as the thermosetting sheet contacts one field of a transparence substrate, it carries out alignment of the thermosetting sheet and flexible substrate with which the appearance was decided. It made to carry out by pasting up one field of a flexible substrate on one field of a transparence substrate into the solution means of said technical problem by stiffening this thermosetting sheet by heating.
[0011] According to this manufacture approach, the process which pastes up one field of a flexible substrate on one field of a transparence substrate with a thermosetting sheet As the opening edge of opening of a flexible substrate is located inside the opening edge of opening of a thermosetting sheet, this flexible substrate is laid on top of a thermosetting sheet. Subsequently Since cutting by punching etc. performs these the appearance arrangements of both and it carries out after that by pasting up one field of a flexible substrate on one field of a transparence substrate by stiffening a thermosetting sheet by heating Since the opening edge of opening of a flexible substrate is located inside the opening edge of opening of

a thermosetting sheet even if the fused thermosetting sheet oozes to the opening side of a flexible substrate, when heating and stiffening a thermosetting sheet it becomes possible to suppress that the melt of the thermosetting sheet which oozed sees and appears in the opening circles of a flexible substrate.

[0012]

[Embodiment of the Invention] Hereafter, this invention is explained in detail. Drawing 1 , drawing 2 , and drawing 3 are drawings showing the 1st example of an operation gestalt of the solid state image sensor of this invention, and a sign 10 is the solid state image sensor of the CCD mold of a chip-size package in these drawings. One field of the flexible substrate (flexible tape) 12 pastes up this solid state image sensor 10 on one field of the transparence substrate (lid) 11 which consists of glass which serves as covering as shown in drawing 1 , or resin. The body 13 of a CCD solid state image sensor is electrically connected to the field of another side of this flexible substrate 12 through the bump 14 who consists of an Au stud bump etc. The field of another side of the flexible substrate 12 and the side face of the body 13 of a solid state image sensor paste up by the sealing compound, the hermetic seal of between said transparence substrates 11 and bodies 13 of a solid state image sensor is carried out, and it is constituted.

[0013] As the flexible substrate 12 is shown in drawing 2 which shows the background of a solid state image sensor 10, and drawing 3 which shows the side front It is what consists of annular Itabe 15 stationed between the transparence substrate 11 and the body 13 of a solid state image sensor, the comparatively thin connection section 16, and quadrilateral Itabe 17 who follows annular Itabe 15 through this connection section 16. As the copper circuit pattern 18 is exposed to the rear-face side, both sides of this are covered with polyimide and it is formed.

[0014] The abbreviation rectangle-like opening 19 is formed in annular Itabe 15, and in this opening 19, image pick-up side 13a of said body 13 of a solid state image sensor faces, and it is arranged. It connects with the body 13 of a solid state image sensor electrically through the bump 14, and a circuit pattern 18 outputs and inputs an electrical signal by external lead 18a formed in quadrilateral Itabe 17.

[0015] The flexible substrate 12 was pasted up on one field of the transparence substrate 11 with adhesives, such as a thermosetting sheet, liquefied heat-curing resin, and UV hardening mold resin, and the thermosetting sheet 20 is used as adhesives in this example. This thermosetting sheet 20 is a once fused thing which carries out postcure by being heated so that the epoxy resin which is thermosetting resin might be made to carry out semi-hardening beforehand, and might be formed and it may mention later.

[0016] In order to manufacture the solid state image sensor 10 of such a configuration, a bump 14 is first formed on aluminum electrode (illustration abbreviation) of the body 13 of a solid state image sensor. In this example, by the stud bump bonder, Au bump is joined on aluminum electrode (illustration abbreviation), and a bump 14 is formed. As junction conditions, the conditions of carrying out 10-30msec heating at the temperature of 150-180 degrees C under pressurization (30-100g) are adopted. In addition, it can replace with Au stud bump and solder etc. can also be used.

[0017] moreover, apart from this, what carried out temporary adhesion of the thermosetting sheet 20 beforehand was prepared for one field of the flexible substrate 12, the thermosetting sheet 20 side of this was joined to the transparence substrate 11, and melting of the thermosetting sheet 20 was once carried out by carrying out a cure in a heat column or oven -- postcure is carried out. In the case of a heat column, about this hardening, it is 200g - 3kg/cm2. The conditions of carrying out a cure for 2 - 20 minutes at the temperature of 150-200 degrees C to the bottom of pressurization are adopted. Moreover, it is 200g - 3kg/cm2 the same in the case of oven. The conditions of carrying out a cure at the temperature of 150-200 degrees C to the bottom of pressurization for 10 minute - 2 hours are adopted.

[0018] Next, Ag paste is applied on the bump 14 of the body 13 of a solid state image sensor, alignment of this bump 14 and the circuit pattern (illustration abbreviation) in the another side side of the flexible substrate 12 is carried out continuously, and between these is pressurized. At this time, alignment is carried out so that image pick-up side 13a of the body 13 of a solid state image sensor may face in the opening 19 of the flexible substrate 12. And it heats 1 minute or more at 150 degrees C by this condition of having pressurized, and Ag paste cure is performed. In addition, only with a pressure welding, if a bump 14 and wiring of the flexible substrate 12 are satisfactory to connectability, they do not need to use Ag paste.

[0019] Subsequently, optimum dose spreading of the sealing compound 21 is carried out by dispensing etc., it pastes up by this sealing compound 21 between the field of another side of the flexible substrate 12, and the side face of the body 13 of a solid state image sensor, and the hermetic seal of between said transparence substrates 11 and bodies 13 of a solid state image sensor is carried out to it. As a sealing compound 21, although UV and a heat concomitant use sealing compound, and a heat-curing-ized sealing compound are usable, it is desirable to use UV heat concomitant use mold resin in respect of workability being good etc. When such UV heat concomitant use mold resin is used, ultraviolet rays are irradiated by 1000-3000mJ, and this is made to harden.

[0020] In addition, about a sealing compound 21, not only using one sort but using two sorts or more than it, it can be

good also as multiplex seal structure, a damp-proof high sealing compound can be used for the interior in that case, and the structure using the low degree-of-hardness sealing compound which prevents a resin crack and a lid crack outside etc. can be adopted. And multiplex seal structure, then damp-proof improvement and improvement in mechanical strength can be aimed at in this way.

[0021] Thus, postcure is performed in order to fully stiffen the whole including the part by which UV irradiation is not carried out, if UV irradiation is performed. In heat block heating, as conditions for this postcure, heating is performed at 140-160 degrees C for 1 minute - 60 minutes. In addition, it replaces with heat block heating and you may make it adopt an oven cure.

[0022] Thus, in the obtained solid state image sensor 10, the appearance size of the transparence substrate 11 used as the maximum appearance at the time of removing the flexible substrate 12 becomes 4-8mm**, when the appearance size of the body 13 of a solid state image sensor is 3-6mm**, and thickness is also set to 1.0-1.3mm. Therefore, compared with the thing of structure which used the package in the air, the solid state image sensor 10 of this invention can miniaturize the appearance size sharply like the former -- for example, package area can be reduced to about 58%, package thickness can be reduced to about 61%, and the package volume can be reduced to about 83%.

[0023] Moreover, by making a sealing compound 21 into multiplex seal structure, for example, damp-proof improvement can be enabled and high-reliability can be realized. Specifically, 100 cycles are [bias / high-humidity/temperature] clearable [about a thermo cycle] at 85degreedegree C and 85% at -55 degrees C - 125 degrees C for 504 hours, respectively.

[0024] Here, an example of the manufacture approach of the solid state image sensor of this invention is explained to one field of the aforementioned flexible substrate 12 based on the process which carries out temporary adhesion of the thermosetting sheet 20 beforehand. First, as shown in drawing 4 (a), the thermosetting large-sized sheet 22 with a thickness of about 20-50 micrometers is prepared, and the opening 23 of the shape of an abbreviation rectangle with every direction larger about 0.4-1.0mm than the opening 19 of the flexible substrate 12 is formed in this oban-like thermosetting sheet 22 by punching.

[0025] Then, the flexible substrate 24 of the multiple string before performing the appearance arrangement which formed the circuit pattern 18 (illustration abbreviation) while forming opening 19 beforehand, as shown in drawing 4 (b) As are shown in drawing 4 (c) and the opening edge of the opening 19 is located inside about 0.2-0.5mm from the opening edge of the opening 23 of said oban-like thermosetting sheet 22, it piles up on this oban-like thermosetting sheet 23.

[0026] Subsequently, the flexible substrate 24 of these multiple strings and the oban-like thermosetting sheet 23 are pierced and cut in both the locations shown with the two-dot chain line in drawing 4 (c), where each appearance is put together, the appearance arrangement is performed, and as shown in drawing 5 (a), temporary adhesion of the thermosetting sheet 20 of a single individual is carried out in one field of the flexible substrate 12 of a single individual with which blanking was made as a result.

[0027] In addition, if it does in this way and temporary adhesion of the thermosetting sheet 20 is carried out in one field of the flexible substrate 12, by carrying out alignment, as the thermosetting sheet 20 of this contacts one field of the transparence substrate 11, and carrying out pressurization heating, as mentioned above, melting hardening of this thermosetting sheet 20 will be carried out, and one field of the flexible substrate 12 will be pasted up on one field of the transparence substrate 11.

[0028] Thus, if one field of the flexible substrate 12 is made to carry out melting hardening of the thermosetting sheet 20 using what carried out temporary adhesion of the thermosetting sheet 20 and one field of the flexible substrate 12 is pasted up on one field of the transparence substrate 11 When heating and stiffening the thermosetting sheet 20, even if the thermosetting sheet 20 fused by pressurizing in order to raise the adhesion of an adhesion side oozes to the opening 19 side of the flexible substrate 12 Since the opening edge of the opening 19 of the flexible substrate 12 is located inside the opening edge of the opening 23 of the thermosetting sheet 20 it can suppress that the melt of the thermosetting sheet 20 which oozed as shown in drawing 5 (b) sees and comes out in the opening 19 of the flexible substrate 12.

[0029] Namely, when the opening edge of the opening 23 of the thermosetting sheet 20 is made in agreement with the opening edge of the opening 19 of the flexible substrate 12 as shown in drawing 5 (c) When carrying out pressurization heating and stiffening the thermosetting sheet 20, as shown in drawing 5 (d), the melt of the thermosetting sheet 20 overflows even in the opening 19 of the flexible substrate 12. Since the opening edge of the opening 19 of the flexible substrate 12 is located inside the opening edge of the opening 23 of the thermosetting sheet 20 as mentioned above in this example of what spoils the image pick-up property of the body 13 of a solid state image sensor it can prevent that the melt of the thermosetting sheet 20 sees and comes out in the opening 19 of the flexible substrate 12.

[0030] Drawing 6 and drawing 7 are drawings showing the 2nd example of an operation gestalt of the solid state image sensor of this invention, in these drawings, a sign 30 is the solid state image sensor of the CCD mold of a chip-size

package, and 32 is a flexible substrate. The place where this solid state image sensor 30 differs from the solid state image sensor 10 shown in drawing 1 , drawing 2 , and drawing 3 is the point that the annular ridge 31 along said opening edge is formed between the connecting locations with a bump 14 and the opening edges of opening 19 in the field (field of the side joined to the body 13 of a solid state image sensor through a bump 14) of another side of said flexible substrate 32.

[0031] This ridge 31 was formed with the photoresist film, is formed in the range of more than height slightly lower than said bump's 14 height, for example, 5 micrometers, and 30 micrometers or less, and is formed in height of 10 micrometers by this example. In addition, it is desirable to consider as near infinite height as height of this ridge 31 at a bump's 14 height. Thus, since the height of a ridge 31 is formed lower than a bump's 14 height, a ridge 31 is arranged so that it may have a clearance slightly to the body 13 of a solid state image sensor, and, therefore, interferes in junction to a bump 14 and wiring 32a on the flexible substrate 32. Moreover, about the width of face of a ridge 31, it considers as 10-micrometer or more 200-micrometer or less extent that what is necessary is just to be able to prevent a permeate lump of adhesives so that it may mention later.

[0032] If it is in the solid state image sensor 30 of such a configuration Since the annular ridge 31 along said opening edge is formed between the connecting locations with a bump 14 and the opening edges of opening 19 in the field of another side of the flexible substrate 32 From functioning as this ridge 31 damming up a sealing compound 21 By the time this sealing compound 21 hardens as the two-dot chain line in drawing 7 shows in case a sealing compound 21 is applied and this is stiffened at the time of manufacture, this will ooze out to the space between the body 13 of a solid state image sensor, and the transparence substrate 11. It can prevent starting image pick-up side 13a of the body 13 of a solid state image sensor, it can continue all over an image pick-up side by this, and good image pick-up quality can be secured. Moreover, since defect generating of such a sealing compound 21 depended for oozing out was prevented, the product yield improved and the cost cut was achieved.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, by the thing of structure using the package 1 in the air, in this way For example, when the body 2 of a solid state image sensor is 4-5mm**, the appearance size of a package 1 is set to 10-12mm. Moreover, the solid state image sensor of the structure where it cannot respond about the thickness that the thickness of a package 1 will be set to 3.0-3.5mm when the body 2 of a solid state image sensor is 0.6mm etc. to the miniaturization demanded increasingly from now on, therefore a package 1 is not used was called for.

[0005] As a solid state image sensor of the structure where such a package 1 is not used, the image pick-up equipment of the structure indicated by JP,5-6989,A is known. At least, an electrode is connected to the inner edge of each of the plate which has a translucent part in a center section, two or more conductor patterns formed in one field of said plate, and said conductor pattern, and this image pick-up equipment has a closure means to seal the space between the image sensor fixed to said plate by turning a light-receiving side, and said plate and said image sensor light-receiving side. However, even if it is in this image pick-up equipment, there is dissatisfaction in respect of the assembly nature at the time of including in portable image pick-up equipments, such as a digital camera, and cost, and the further improvement is called for.

[0006] This invention was made in view of said situation, and the place made into the purpose is to offer the solid state image sensor and its manufacture approach of the chip-size package structure improved also about the assembly nature at the time of including in image pick-up equipment, and the field of cost.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, since the body of a solid state image sensor is prepared in one field of a transparence substrate through a flexible substrate, the solid state image sensor of this invention becomes that by which the whole became the thing of chip-size package structure, and was miniaturized, and may be used suitable for portable image pick-up equipments, such as a digital camera, thereby, for example. Moreover, since the assembly nature at the time of including in image pick-up equipments, such as a digital camera, with the circuit pattern of this flexible substrate since the body of a solid state image sensor is electrically connected to the flexible substrate in which the circuit pattern was formed becomes good and production of the flexible substrate itself becomes cheap compared with forming a direct circuit pattern in a transparence substrate, it becomes advantageous also about the field of the whole cost.
[0034] Moreover, between a connecting location with said bump of the field of another side of a flexible substrate, and the opening edge of opening If the annular ridge along said opening edge is formed in height lower than said bump's height Since it functions as this ridge damming up a sealing compound, by the time a sealing compound hardens, this will ooze out to the space between the body of a solid state image sensor, and a transparence substrate. It can prevent starting the image pick-up side of the body of a solid state image sensor, it can continue all over an image pick-up side by this, and good image pick-up quality can be secured. Moreover, since defect generating of such a sealing compound depended for oozing out can be prevented, the product yield can be improved and a cost cut can be aimed at.
[0035] The manufacture approach of the solid state image sensor of this invention by having located the opening edge of opening of a flexible substrate inside the opening edge of opening of a thermosetting sheet When heating and stiffening a thermosetting sheet, even if the fused thermosetting sheet oozes to the opening side of a flexible substrate since it suppresses that the melt of the thermosetting sheet which oozed sees and appears in the opening circles of a flexible substrate It can prevent applying the resin which forms a thermosetting sheet on the image pick-up side of the body of a solid state image sensor, and the dependability of the image pick-up engine performance can be secured, and the defect by the flash of resin can be prevented, stabilization of an assembly manufacture process can be attained, and the yield can be improved.

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PRIOR ART

[Description of the Prior Art] The miniaturization follows the solid state camera equipped with the solid state image sensor on progressing, and it is briskly used increasingly as portable image pick-up equipments, such as a digital camera. A solid state image sensor is a semiconductor device which has the function which is equipped with a micro lens on chip etc. and condenses, and the function to have a photo-electric-conversion circuit and to make photo electric conversion, receives the light from a photographic subject, changes this into an electrical signal, and is outputted. In addition, on these specifications, a "solid state image sensor" is called for convenience including a solid state image sensor, the transparence substrate holding this, etc., and "the body of a solid state image sensor" is called about the solid state image sensor itself. [0003] As conventionally shown in drawing 8 as a solid state image sensor, the body 2 of a solid state image sensor is carried in the package 1 in the air which consists of resin or ceramics, wirebonding of this body 2 of a solid state image sensor and inner lead 3 is carried out, the body 2 of a solid state image sensor is electrically connected with the external lead 5 through this inner lead 3, and the thing of the structure which closed the centrum which carried the body 2 of a solid state image sensor with the transparence substrate (lid) 4 which consists of glass or resin is known.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the solid state image sensor and its manufacture approach of chip-size package structure.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the solid state image sensor and its manufacture approach of chip-size package structure.
[0002]
[Description of the Prior Art] The miniaturization follows the solid state camera equipped with the solid state image sensor on progressing, and it is briskly used increasingly as portable image pick-up equipments, such as a digital camera. A solid state image sensor is a semiconductor device which has the function which is equipped with a micro lens on chip etc. and condenses, and the function to have a photo-electric-conversion circuit and to make photo electric conversion, receives the light from a photographic subject, changes this into an electrical signal, and is outputted. In addition, on these specifications, a "solid state image sensor" is called for convenience including a solid state image sensor, the transparence substrate holding this, etc., and "the body of a solid state image sensor" is called about the solid state image sensor itself.
[0003] As conventionally shown in drawing 8 as a solid state image sensor, the body 2 of a solid state image sensor is carried in the package 1 in the air which consists of resin or ceramics, wirebonding of this body 2 of a solid state image sensor and inner lead 3 is carried out, the body 2 of a solid state image sensor is electrically connected with the external lead 5 through this inner lead 3, and the thing of the structure which closed the centrum which carried the body 2 of a solid state image sensor with the transparence substrate (lid) 4 which consists of glass or resin is known.
[0004]
[Problem(s) to be Solved by the Invention] however, by the thing of structure using the package 1 in the air, in this way For example, when the body 2 of a solid state image sensor is 4-5mm**, the appearance size of a package 1 is set to 10-12mm. Moreover, the solid state image sensor of the structure where it cannot respond about the thickness that the thickness of a package 1 will be set to 3.0-3.5mm when the body 2 of a solid state image sensor is 0.6mm etc. to the miniaturization demanded increasingly from now on, therefore a package 1 is not used was called for.
[0005] As a solid state image sensor of the structure where such a package 1 is not used, the image pick-up equipment of the structure indicated by JP,5-6989,A is known. At least, an electrode is connected to the inner edge of each of the plate which has a translucent part in a center section, two or more conductor patterns formed in one field of said plate, and said conductor pattern, and this image pick-up equipment has a closure means to seal the space between the image sensor fixed to said plate by turning a light-receiving side, and said plate and said image sensor light-receiving side. However, even if it is in this image pick-up equipment, there is dissatisfaction in respect of the assembly nature at the time of including in portable image pick-up equipments, such as a digital camera, and cost, and the further improvement is called for.
[0006] This invention was made in view of said situation, and the place made into the purpose is to offer the solid state image sensor and its manufacture approach of the chip-size package structure improved also about the assembly nature at the time of including in image pick-up equipment, and the field of cost.
[0007]
[Means for Solving the Problem] The solid state image sensor of this invention forms a circuit pattern in one field of a transparence substrate, and one field of a flexible substrate with opening pastes it up. The body of a solid state image sensor is electrically connected to the field of another side of this flexible substrate through a bump in the condition of having made that image pick-up side overlooking in said opening. The field of another side of said flexible substrate and the thing of the body of a solid state image sensor which a side face pastes up by the sealing compound at least, and it comes to do the hermetic seal of between said transparence substrates and bodies of a solid state image sensor were made into the solution means of said technical problem.

[0008] According to this solid state image sensor, since the body of a solid state image sensor was prepared in one field of a transparence substrate through the flexible substrate, the whole became the thing of chip-size package structure, and was miniaturized. Moreover, since the assembly nature at the time of including in image pick-up equipments, such as a digital camera, with the circuit pattern of this flexible substrate since the body of a solid state image sensor is electrically connected to the flexible substrate in which the circuit pattern was formed becomes good and production of the flexible substrate itself becomes cheap compared with forming a direct circuit pattern in a transparence substrate, it becomes advantageous also about the field of the whole cost.

[0009] Moreover, if the annular ridge along said opening edge is formed in height lower than said bump's height between a connecting location with said bump of the field of another side of said flexible substrate, and the opening edge of opening, since it will function as this ridge damming up a sealing compound, it is suppressed that this will ooze to the space between the body of a solid state image sensor and a transparence substrate by the time a sealing compound hardens.

[0010] moreover, by the manufacture approach of the solid state image sensor of this invention The process which forms a circuit pattern in one field of a transparence substrate, and pastes up one field of a flexible substrate with opening with a thermosetting sheet, The process electrically connected to the field of another side of this flexible substrate through a bump in the condition that that image pick-up side faces the body of a solid state image sensor in said opening, In the manufacture approach of the solid state image sensor of the chip-size package structure equipped with the field of another side of said flexible substrate, and the process of the body of a solid state image sensor which pastes up a side face by the sealing compound at least, and carries out the hermetic seal of between said transparence substrates and bodies of a solid state image sensor The process which pastes up one field of a flexible substrate on one field of a transparence substrate with a thermosetting sheet Opening with larger opening than opening of a flexible substrate is formed in the thermosetting sheet before performing an appearance arrangement. Then, the flexible substrate before performing the appearance arrangement which formed the circuit pattern while forming opening beforehand It is made for the opening edge of opening of this flexible substrate to be located inside the opening edge of opening of said thermosetting sheet. On this thermosetting sheet Superposition, Subsequently, where each appearance is together put by cutting these [both], the appearance arrangement is performed. In the condition of having piled up after that, as the thermosetting sheet contacts one field of a transparence substrate, it carries out alignment of the thermosetting sheet and flexible substrate with which the appearance was decided. It made to carry out by pasting up one field of a flexible substrate on one field of a transparence substrate into the solution means of said technical problem by stiffening this thermosetting sheet by heating.

[0011] According to this manufacture approach, the process which pastes up one field of a flexible substrate on one field of a transparence substrate with a thermosetting sheet As the opening edge of opening of a flexible substrate is located inside the opening edge of opening of a thermosetting sheet, this flexible substrate is laid on top of a thermosetting sheet. Subsequently Since cutting by punching etc. performs these the appearance arrangements of both and it carries out after that by pasting up one field of a flexible substrate on one field of a transparence substrate by stiffening a thermosetting sheet by heating Since the opening edge of opening of a flexible substrate is located inside the opening edge of opening of a thermosetting sheet even if the fused thermosetting sheet oozes to the opening side of a flexible substrate, when heating and stiffening a thermosetting sheet it becomes possible to suppress that the melt of the thermosetting sheet which oozed sees and appears in the opening circles of a flexible substrate.

[0012]

[Embodiment of the Invention] Hereafter, this invention is explained in detail. Drawing 1 , drawing 2 , and drawing 3 are drawings showing the 1st example of an operation gestalt of the solid state image sensor of this invention, and a sign 10 is the solid state image sensor of the CCD mold of a chip-size package in these drawings. One field of the flexible substrate (flexible tape) 12 pastes up this solid state image sensor 10 on one field of the transparence substrate (lid) 11 which consists of glass which serves as covering as shown in drawing 1 , or resin. The body 13 of a CCD solid state image sensor is electrically connected to the field of another side of this flexible substrate 12 through the bump 14 who consists of an Au stud bump etc. The field of another side of the flexible substrate 12 and the side face of the body 13 of a solid state image sensor paste up by the sealing compound, the hermetic seal of between said transparence substrates 11 and bodies 13 of a solid state image sensor is carried out, and it is constituted.

[0013] As the flexible substrate 12 is shown in drawing 2 which shows the background of a solid state image sensor 10, and drawing 3 which shows the side front It is what consists of annular Itabe 15 stationed between the transparence substrate 11 and the body 13 of a solid state image sensor, the comparatively thin connection section 16, and quadrilateral Itabe 17 who follows annular Itabe 15 through this connection section 16. As the copper circuit pattern 18 is exposed to the rear-face side, both sides of this are covered with polyimide and it is formed.

[0014] The abbreviation rectangle-like opening 19 is formed in annular Itabe 15, and in this opening 19, image pick-up

side 13a of said body 13 of a solid state image sensor faces, and it is arranged. It connects with the body 13 of a solid state image sensor electrically through the bump 14, and a circuit pattern 18 outputs and inputs an electrical signal by external lead 18a formed in quadrilateral Itabe 17.

[0015] The flexible substrate 12 was pasted up on one field of the transparence substrate 11 with adhesives, such as a thermosetting sheet, liquefied heat-curing resin, and UV hardening mold resin, and the thermosetting sheet 20 is used as adhesives in this example. This thermosetting sheet 20 is a once fused thing which carries out postcure by being heated so that the epoxy resin which is thermosetting resin might be made to carry out semi-hardening beforehand, and might be formed and it may mention later.

[0016] In order to manufacture the solid state image sensor 10 of such a configuration, a bump 14 is first formed on aluminum electrode (illustration abbreviation) of the body 13 of a solid state image sensor. In this example, by the stud bump bonder, Au bump is joined on aluminum electrode (illustration abbreviation), and a bump 14 is formed. As junction conditions, the conditions of carrying out 10-30msec heating at the temperature of 150-180 degrees C under pressurization (30-100g) are adopted. In addition, it can replace with Au stud bump and solder etc. can also be used.

[0017] moreover, apart from this, what carried out temporary adhesion of the thermosetting sheet 20 beforehand was prepared for one field of the flexible substrate 12, the thermosetting sheet 20 side of this was joined to the transparence substrate 11, and melting of the thermosetting sheet 20 was once carried out by carrying out a cure in a heat column or oven -- postcure is carried out. In the case of a heat column, about this hardening, it is 200g - 3kg/cm2. The conditions of carrying out a cure for 2 - 20 minutes at the temperature of 150-200 degrees C to the bottom of pressurization are adopted. Moreover, it is 200g - 3kg/cm2 the same in the case of oven. The conditions of carrying out a cure at the temperature of 150-200 degrees C to the bottom of pressurization for 10 minute - 2 hours are adopted.

[0018] Next, Ag paste is applied on the bump 14 of the body 13 of a solid state image sensor, alignment of this bump 14 and the circuit pattern (illustration abbreviation) in the another side side of the flexible substrate 12 is carried out continuously, and between these is pressurized. At this time, alignment is carried out so that image pick-up side 13a of the body 13 of a solid state image sensor may face in the opening 19 of the flexible substrate 12. And it heats 1 minute or more at 150 degrees C by this condition of having pressurized, and Ag paste cure is performed. In addition, only with a pressure welding, if a bump 14 and wiring of the flexible substrate 12 are satisfactory to connectability, they do not need to use Ag paste.

[0019] Subsequently, optimum dose spreading of the sealing compound 21 is carried out by dispensing etc., it pastes up by this sealing compound 21 between the field of another side of the flexible substrate 12, and the side face of the body 13 of a solid state image sensor, and the hermetic seal of between said transparence substrates 11 and bodies 13 of a solid state image sensor is carried out to it. As a sealing compound 21, although UV and a heat concomitant use sealing compound, and a heat-curing-ized sealing compound are usable, it is desirable to use UV heat concomitant use mold resin in respect of workability being good etc. When such UV heat concomitant use mold resin is used, ultraviolet rays are irradiated by 1000-3000mJ, and this is made to harden.

[0020] In addition, about a sealing compound 21, not only using one sort but using two sorts or more than it, it can be good also as multiplex seal structure, a damp-proof high sealing compound can be used for the interior in that case, and the structure using the low degree-of-hardness sealing compound which prevents a resin crack and a lid crack outside etc. can be adopted. And multiplex seal structure, then damp-proof improvement and improvement in mechanical strength can be aimed at in this way.

[0021] Thus, postcure is performed in order to fully stiffen the whole including the part by which UV irradiation is not carried out, if UV irradiation is performed. In heat block heating, as conditions for this postcure, heating is performed at 140-160 degrees C for 1 minute - 60 minutes. In addition, it replaces with heat block heating and you may make it adopt an oven cure.

[0022] Thus, in the obtained solid state image sensor 10, the appearance size of the transparence substrate 11 used as the maximum appearance at the time of removing the flexible substrate 12 becomes 4-8mm**, when the appearance size of the body 13 of a solid state image sensor is 3-6mm**, and thickness is also set to 1.0-1.3mm. Therefore, compared with the thing of structure which used the package in the air, the solid state image sensor 10 of this invention can miniaturize the appearance size sharply like the former -- for example, package area can be reduced to about 58%, package thickness can be reduced to about 61%, and the package volume can be reduced to about 83%.

[0023] Moreover, by making a sealing compound 21 into multiplex seal structure, for example, damp-proof improvement can be enabled and high-reliability can be realized. Specifically, 100 cycles are [bias / high-humidity/temperature] clearable [about a thermo cycle] at 85degreedegree C and 85% at -55 degrees C - 125 degrees C for 504 hours, respectively.

[0024] Here, an example of the manufacture approach of the solid state image sensor of this invention is explained to one

field of the aforementioned flexible substrate 12 based on the process which carries out temporary adhesion of the thermosetting sheet 20 beforehand. First, as shown in drawing 4 (a), the thermosetting large-sized sheet 22 with a thickness of about 20-50 micrometers is prepared, and the opening 23 of the shape of an abbreviation rectangle with every direction larger about 0.4-1.0mm than the opening 19 of the flexible substrate 12 is formed in this oban-like thermosetting sheet 22 by punching.

[0025] Then, the flexible substrate 24 of the multiple string before performing the appearance arrangement which formed the circuit pattern 18 (illustration abbreviation) while forming opening 19 beforehand, as shown in drawing 4 (b) As are shown in drawing 4 (c) and the opening edge of the opening 19 is located inside about 0.2-0.5mm from the opening edge of the opening 23 of said oban-like thermosetting sheet 22, it piles up on this oban-like thermosetting sheet 23.

[0026] Subsequently, the flexible substrate 24 of these multiple strings and the oban-like thermosetting sheet 23 are pierced and cut in both the locations shown with the two-dot chain line in drawing 4 (c), where each appearance is put together, the appearance arrangement is performed, and as shown in drawing 5 (a), temporary adhesion of the thermosetting sheet 20 of a single individual is carried out in one field of the flexible substrate 12 of a single individual with which blanking was made as a result.

[0027] In addition, if it does in this way and temporary adhesion of the thermosetting sheet 20 is carried out in one field of the flexible substrate 12, by carrying out alignment, as the thermosetting sheet 20 of this contacts one field of the transparence substrate 11, and carrying out pressurization heating, as mentioned above, melting hardening of this thermosetting sheet 20 will be carried out, and one field of the flexible substrate 12 will be pasted up on one field of the transparence substrate 11.

[0028] Thus, if one field of the flexible substrate 12 is made to carry out melting hardening of the thermosetting sheet 20 using what carried out temporary adhesion of the thermosetting sheet 20 and one field of the flexible substrate 12 is pasted up on one field of the transparence substrate 11 When heating and stiffening the thermosetting sheet 20, even if the thermosetting sheet 20 fused by pressurizing in order to raise the adhesion of an adhesion side oozes to the opening 19 side of the flexible substrate 12 Since the opening edge of the opening 19 of the flexible substrate 12 is located inside the opening edge of the opening 23 of the thermosetting sheet 20 it can suppress that the melt of the thermosetting sheet 20 which oozed as shown in drawing 5 (b) sees and comes out in the opening 19 of the flexible substrate 12.

[0029] Namely, when the opening edge of the opening 23 of the thermosetting sheet 20 is made in agreement with the opening edge of the opening 19 of the flexible substrate 12 as shown in drawing 5 (c) When carrying out pressurization heating and stiffening the thermosetting sheet 20, as shown in drawing 5 (d), the melt of the thermosetting sheet 20 overflows even in the opening 19 of the flexible substrate 12. Since the opening edge of the opening 19 of the flexible substrate 12 is located inside the opening edge of the opening 23 of the thermosetting sheet 20 as mentioned above in this example of what spoils the image pick-up property of the body 13 of a solid state image sensor it can prevent that the melt of the thermosetting sheet 20 sees and comes out in the opening 19 of the flexible substrate 12.

[0030] Drawing 6 and drawing 7 are drawings showing the 2nd example of an operation gestalt of the solid state image sensor of this invention, in these drawings, a sign 30 is the solid state image sensor of the CCD mold of a chip-size package, and 32 is a flexible substrate. The place where this solid state image sensor 30 differs from the solid state image sensor 10 shown in drawing 1 , drawing 2 , and drawing 3 is the point that the annular ridge 31 along said opening edge is formed between the connecting locations with a bump 14 and the opening edges of opening 19 in the field (field of the side joined to the body 13 of a solid state image sensor through a bump 14) of another side of said flexible substrate 32.

[0031] This ridge 31 was formed with the photoresist film, is formed in the range of more than height slightly lower than said bump's 14 height, for example, 5 micrometers, and 30 micrometers or less, and is formed in height of 10 micrometers by this example. In addition, it is desirable to consider as near infinite height as height of this ridge 31 at a bump's 14 height. Thus, since the height of a ridge 31 is formed lower than a bump's 14 height, a ridge 31 is arranged so that it may have a clearance slightly to the body 13 of a solid state image sensor, and, therefore, interferes in junction to a bump 14 and wiring 32a on the flexible substrate 32. Moreover, about the width of face of a ridge 31, it considers as 10-micrometer or more 200-micrometer or less extent that what is necessary is just to be able to prevent a permeate lump of adhesives so that it may mention later.

[0032] If it is in the solid state image sensor 30 of such a configuration Since the annular ridge 31 along said opening edge is formed between the connecting locations with a bump 14 and the opening edges of opening 19 in the field of another side of the flexible substrate 32 From functioning as this ridge 31 damming up a sealing compound 21 By the time this sealing compound 21 hardens as the two-dot chain line in drawing 7 shows in case a sealing compound 21 is applied and this is stiffened at the time of manufacture, this will ooze out to the space between the body 13 of a solid state image sensor, and the transparence substrate 11. It can prevent starting image pick-up side 13a of the body 13 of a solid state image sensor, it can continue all over an image pick-up side by this, and good image pick-up quality can be secured.

Moreover, since defect generating of such a sealing compound 21 depended for oozing out was prevented, the product yield improved and the cost cut was achieved.

[0033]

[Effect of the Invention] As explained above, since the body of a solid state image sensor is prepared in one field of a transparence substrate through a flexible substrate, the solid state image sensor of this invention becomes that by which the whole became the thing of chip-size package structure, and was miniaturized, and may be used suitable for portable image pick-up equipments, such as a digital camera, thereby, for example. Moreover, since the assembly nature at the time of including in image pick-up equipments, such as a digital camera, with the circuit pattern of this flexible substrate since the body of a solid state image sensor is electrically connected to the flexible substrate in which the circuit pattern was formed becomes good and production of the flexible substrate itself becomes cheap compared with forming a direct circuit pattern in a transparence substrate, it becomes advantageous also about the field of the whole cost.

[0034] Moreover, between a connecting location with said bump of the field of another side of a flexible substrate, and the opening edge of opening If the annular ridge along said opening edge is formed in height lower than said bump's height Since it functions as this ridge damming up a sealing compound, by the time a sealing compound hardens, this will ooze out to the space between the body of a solid state image sensor, and a transparence substrate. It can prevent starting the image pick-up side of the body of a solid state image sensor, it can continue all over an image pick-up side by this, and good image pick-up quality can be secured. Moreover, since defect generating of such a sealing compound depended for oozing out can be prevented, the product yield can be improved and a cost cut can be aimed at.

[0035] The manufacture approach of the solid state image sensor of this invention by having located the opening edge of opening of a flexible substrate inside the opening edge of opening of a thermosetting sheet When heating and stiffening a thermosetting sheet, even if the fused thermosetting sheet oozes to the opening side of a flexible substrate since it suppresses that the melt of the thermosetting sheet which oozed sees and appears in the opening circles of a flexible substrate It can prevent applying the resin which forms a thermosetting sheet on the image pick-up side of the body of a solid state image sensor, and the dependability of the image pick-up engine performance can be secured, and the defect by the flash of resin can be prevented, stabilization of an assembly manufacture process can be attained, and the yield can be improved.

[Translation done.]

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Form a circuit pattern in one field of a transparence substrate, and one field of a flexible substrate with opening pastes up. The body of a solid state image sensor is electrically connected to the field of another side of this flexible substrate through a bump in the condition of having made that image pick-up side overlooking in said opening. The solid state image sensor characterized by the field of another side of said flexible substrate, and the thing of the body of a solid state image sensor which a side face pastes up by the sealing compound at least, and it comes to do the hermetic seal of between said transparence substrates and bodies of a solid state image sensor.
[Claim 2] The solid state image sensor according to claim 1 characterized by forming the annular ridge along said opening edge in height lower than said bump's height between a connecting location with said bump, and the opening edge of opening in the field of another side of said flexible substrate.
[Claim 3] The process which forms a circuit pattern in one field of a transparence substrate, and pastes up one field of a flexible substrate with opening with a thermosetting sheet, The process electrically connected to the field of another side of this flexible substrate through a bump in the condition that that image pick-up side faces the body of a solid state image sensor in said opening, It is the manufacture approach of the solid state image sensor of the chip-size package structure equipped with the field of another side of said flexible substrate, and the process of the body of a solid state image sensor which pastes up a side face by the sealing compound at least, and carries out the hermetic seal of between said transparence substrates and bodies of a solid state image sensor. The process which pastes up one field of a flexible substrate on one field of a transparence substrate with a thermosetting sheet Opening with larger opening than opening of a flexible substrate is formed in the thermosetting sheet before performing an appearance arrangement. Then, the flexible substrate before performing the appearance arrangement which formed the circuit pattern while forming opening beforehand It is made for the opening edge of opening of this flexible substrate to be located inside the opening edge of opening of said thermosetting sheet. On this thermosetting sheet Superposition, Subsequently, where each appearance is together put by cutting these [both], the appearance arrangement is performed. In the condition of having piled up after that, as the thermosetting sheet contacts one field of a transparence substrate, it carries out alignment of the thermosetting sheet and flexible substrate with which the appearance was decided. The manufacture approach of the solid state image sensor characterized by carrying out by pasting up one field of a flexible substrate on one field of a transparence substrate by stiffening this thermosetting sheet by heating.

[Translation done.]